M403K Calculus I for Business & Economics
unique numbers 46490, 46495 & 46500

Text Haeussler & Paul Intro. Math Analysis... 5th Ed
Chapters 5, 6, 10 – 14

Lectures SF Bellenot office RLM 12.122 MWF 1-2

TA J. Berberian office RLM 11.138

Prereqs Math Level I ≥ 460, M301 ≥ B, M304E ≥ C or M305G ≥ C
(See separate prereq warning handout)

Final Tues 15 Dec 9 am. Worth 35% of your grade. Closed book and comprehensive.

Tests 3 closed book tests will be given on (Weds) 23 sept, 21 Oct and 18 Nov in . No make up tests will be given. Each test is worth 20% of your grade

HW homework makes up the final 5% of your grade. It will be assign and collected in the lab sessions. Late homework will NOT be accepted. Students may discuss homework, but all written work must be prepaid separately. Grader is still "yet to be named"

GRADE The classic 90% A, 80% B, 70% C & 60% D grading scale (no curve). At least a 70% average is needed to obtain a PASS on the PASS/FAIL scale.

M403K Practice Test I Each Problem worth 10 points

1. Evaluate A. $\log_2 8$ B. $\log_5 (5\sqrt{5})^5$

2. Find the present value of $100 per month for 6 years at 8% compoundedly monthly

3. Money is worth 5% compounded quarterly. Find
   A. The compound amount of $27.00 in $12\frac{1}{2}$ years,
   B. The present value of 10^9 (10^9 = one billion) seven years from now

4. A. Express $3(\log x + \log y - 2\log z)$ as a single logarithm
   B. Write $\log \frac{x^2\sqrt{x+1}}{\sqrt[3]{x^2+2}}$ in terms of $\log x$ $\log(x+1)$ & $\log(x^2+2)$

5. A. Solve for x in terms of ln $e^{2x-5} + 1 = 4$
   B. Solve for x $\log_x(6-x) = 2$

6. Find the monthly payment for a loan on $12,000 at 6% compounded monthly if the term of the loan is A. 36 months? B. 48 months?

7. $A = 100e^{-0.035t}$ gives the amount of Z^{109} (a radioactive substance) in mg when t is time in years from now. To the nearest mg how much Z^{109} will be present in 20 years.

8. How many monthly payments of $250 will it take to pay off a dept of $3500 if money is worth 6% compounded monthly

9. Solve for x simplify A $4^{\log_4 x + \log_4 2} = 3$ B. $8^{\log_2 n} = b^x$

10. What is the present value at birth of a present of 2^k dollars for the k^{th} birthday for birthdays 1 thru 6. Money is worth 4% compounded annually

M 035 Mid Term

Show ALL Work for CREDIT

Only front sides will be graded.

name _____

signature _____

SSno _____

1. SIMPLIFY

A. $\dfrac{(-a^{-2}b)^3}{(ab^{-1})^2}$

B. $\dfrac{z^2-1}{z^3-1}$

2. For $p(x) = x^2+9x-9$

A. Find All ROOTS

B. FIND The Vertex

3. Determine the center and radius of the circle given by the equation $x^2+y^2+4x-6y-3=0$

4. Solve the inequality. write your answer using interval notation

$$\frac{2}{x-2} - \frac{1}{x+3} > 0$$

5. Find the inverse function to $y = \frac{x-1}{x-2}$

6. Write your answers in the form $y = mx + b$

A. The equation of the line through (5,4) parallel to $3x + 2y - 15 = 0$

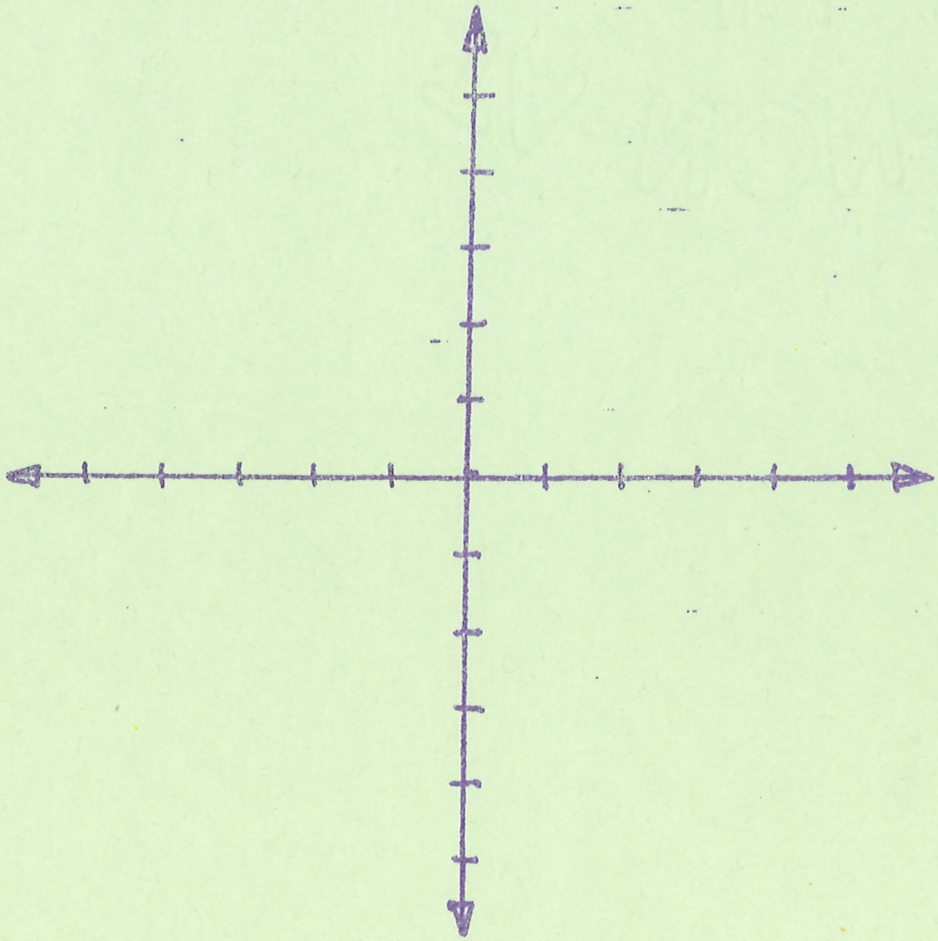
B. The equation of the line through (5,4) perpendicular to $3x + 2y - 15 = 0$

7. Find all of the points where the line $3y - x - 10 = 0$ intersects the circle $x^2 + y^2 - 2x - 4y - 20 = 0$

8. Completely factor $x^4 - 5x^3 - 4x^2 + 20x$

9. A riverboat travels 6 miles downstream in 20 minutes. The return trip, upstream, takes 30 minutes. Determine the speed of the river current and the speed of the boat in still water. Give your answers in "miles per hour" units.

10. GRAPH $y = \frac{2x-1}{x-1}$. LABEL ALL HORT. & VERT. ASYM.



1. Find $\frac{ds}{dx}$ if $s = 7x^{\pi} + 7x^{7/8} + \ell n 5x + e^{2x+3} + e^{\pi}$

2. $\lim_{t \to 3^-} \frac{t^2 + 7t + 12}{t^2 + 5t + 6}$

3. $\lim_{x \to \infty} \frac{7 - x^2 + 100x^3}{37x^2 - 25x^3 + 15}$

4. $\lim_{y \to 8} \frac{2y^2 - 13y - 24}{y^2 - 16y + 64}$

5. $z = (w^5 + w^{1/2} + \ell n\, w)^{1/0}(e^{4w^2+3} + 7)^5$ find z'

6. Find the equation of the tangent line to $y = \frac{x^3 + 1}{x^3 - 1}$ at $x = 4$

7. Solve the inequality $\frac{(x-2)(x-6)^2(x-10)^3}{(x-4)(x-8)^2} < 0$

8. The total cost function is $c = 2^q + \log_2 q + \ell n \sqrt{q^3(q^4 - 1)}$. Find the marginal cost.

9. Use the definition of the derivative to show that if $f(x) = \sqrt{x}$ then $f'(x) = \frac{1}{2\sqrt{x}}$

10. Is $f(x)$ cont or discont at $x = -1$, $x = 0$ and $x = 4$? Why? if

$$f(x) = \begin{cases} x^2 - x & x < -1 \\ \sqrt{x+5} & -1 < x \leq 4 \\ x^{3/2} & 4 < x \end{cases}$$

M403K Practise Test 3

1. Find y' by implicit differentiation: $\ln(xy) + xe^y = 1$.

2. Find y' by logarithmic differentiation:
$$y = \frac{(8x+3)^{1/2}(x^2+2)^{2/3}}{(1+2x)^{5/4}}$$

3. Find the horizontal and vertical asymptotes to
   A. $\frac{2x^2+7}{x^2+x-6}$ B. $3-e^x$

4. Find the equation of the tangent line to $y^2 - x^2 + xy = 5$ at $(4,3)$

5. Use the tangent line (or differential) to approximate $(17)^{5/2}$

6. Find the maximum and minimum values and the points where they occur for
$$f(x) = x^2 + x^{-2} \text{ on } \left[\frac{1}{10}, 100\right]$$

7. Find η (point elasticity of demand) for $q = p^2 - 60p + 898$ at $p = 10$ (Find dp/dq implicitly)

8. For $y = (x+2)^3(x-5)^2$ find all relative extrema and points of inflection, determine where the function is increasing, decreasing, smiling and frowning do NOT sketch the graph.

9. Find two nonnegative numbers whose sum is 20 and such that the product of twice one of the numbers and the square of the other number will be a maximum.

10. Sketch the graph of $f(x)$ given $\lim_{x\to-\infty} f(x) = 3$, $f(1) = 2$, $f(2) = 1$, $\lim_{x\to 3^-} f(x) = +\infty$, $\lim_{x\to 3^+} f(x) = -\infty$, $f(4) = 3$ $f(5) = 4$ $\lim_{x\to\infty} f(x) = 5$, $f'(x) = 0$ at $x = 2, 4$; $f'(x)$ undefined at $x = 3, 5$
$f(x) > 0$ on $(2,3) \cup (3,4) \cup (4,5) \cup (5,\infty)$; $f(x) < 0$ on $(-\infty, 2)$
$f''(x) = 0$ at $x = 1$, $x = 4$; $f''(x)$ undefined at $x = 3, 5$
$f''(x) > 0$ on $(1,3) \cup (4,5)$; $f''(x) < 0$ on $(-\infty, 1) \cup (3,4) \cup (5,\infty)$

Chapt 14 PT

1. $\int \left(z^3 + 2z - 7 + \frac{1}{z^2} + \sqrt{z} \right) dz = ?$

2. $\int_0^1 (2x+1)(x^2+x)^4 \, dx = ?$

3. $\int_1^2 \frac{t^2}{2+t^3} \, dt = ?$

4. $\int_0^2 s e^{4-s^2} \, ds = ?$

5. $\int \frac{z^2}{z-1} \, dz = ?$

6. evaluate $\sum_{k=3}^{4} \frac{(-1)^k (k+1)}{2^k}$ simplify

7. Find y given $y'' = x+1$, $y(0) = 5$, $y'(0) = 0$.

8. If marginal revenue is given by $\frac{dr}{dq} = 100 - \frac{3}{2}\sqrt{2q}$, determine the corp. demand equation.

9. Find the area of the region bounded by the given curve, the x-axis and the given lines.
$y = x^2 - x - 2$, $x = -2$, $x = 2$.

10. Find the area of the region bounded by the ~~given~~ curves $y = x^2 - 2x$ & $y = 12 - x^2$.

TEST 2 21 Oct. 1987 M403K NAME _____

Each problem is worth 10 points STUDENT NO. _____

Show ALL work for Credit. The Back sides will not be graded

1. Find the derivative of

$$f(x) = 3x^{10} + \frac{1}{7x^7} + \sqrt{x^3} + 2^x + 17$$

2. Find $\lim_{y \to 3} \dfrac{y^2 + y - 12}{y^2 - 9}$

3. Find $\lim_{h \to 0} \frac{1}{h}\left[\frac{1}{x+h} - \frac{1}{x}\right]$

4. Find $\lim_{t \to 4^+} \frac{t^2 - 25}{t^2 - 2t - 8}$

5. Find $\lim_{z \to 2^-} \dfrac{z^2 - z - 56}{z^2 + 5z + 6}$

6. Find the marginal revenue if the total revenue function is given by

$$r = (q^3 + q^{-3})^6 e^{4q^2 + q}$$

7. Find the velocity if the position s at time t is given by

$$s = \ln \sqrt[5]{\frac{t^3+100}{t^2+t+1}}$$

8. Find the equation of the tangent line to $y = -\frac{15x}{1+x^2}$ at $x = -2$

9. Solve $\frac{(x^2-9)(x^2-16)}{x^2-4x+4} > 0$

10. Use the definition of $f'(x)$ to show that if $f(x) = \sqrt{2x}$ then $f'(x) = \frac{1}{\sqrt{2x}}$

M403K TEST 3 18 NOV 1987 name _____

Each Problem Worth 10 points SS. No _____

Show ALL Work for credit signature _____

1. Find the fourth derivative of $y = x^9 + x^{-1}$.

2. Implicitly find y' given $x^2 + x^3y^2 + e^y = 17$.

3. Use logarithmic differentiation to find $\frac{dy}{dx}$ if $y = x^x$. (show all steps)

4. Find the horizonal and vertical asymptotes to

A. $\dfrac{x^2+7x}{2x^2-7x+6}$ B. $1 + e^{-x}$

5. Find the equation of the tangent line to $x^2+xy+y^3=23$ at $(3,2)$.

6. Find the maximum and minimum functional values of $f(x) = 2x + 8x^{-1}$ on $[-5, -1]$.

7. Use the tangent line (or differential) to approximate $(25.3)^{3/2}$.

8. Find all relative mins and maxs and all points of inflection of $f(x) = 2x^3 - 15x^2 + 36x$ (graphing is NOT required)

9. For a monopolist's product, the demand function is $p = 50/\sqrt{q}$ and the average cost function is $\bar{c} = 1.5 + \frac{1000}{q}$. Find the profit-maximizing price and output.

10. Sketch the graph of $f(x)$ given $\lim_{x\to-\infty} f(x) = 0$, $f(-2) = 1$, $f(-1) = 2$, $f(0) = 0$, $f(1) = -2$, $f(2) = -1$, $\lim_{x\to\infty} f(x) = 0$; $f'(x) = 0$ at $x = \pm 1$, $f'(x) > 0$ on $(-\infty, -1) \cup (1, \infty)$, $f'(x) < 0$ on $(-1, 1)$; $f''(x) = 0$ at $x = \pm 2$ and 0, $f''(x) > 0$ on $(-\infty, -1) \cup (0, 2)$, $f''(x) < 0$ on $(-2, 0) \cup (2, \infty)$.

M403K FINAL PT 1 15DEC87 Name

Each Problem Worth 10 points SS No

Show ALL Work for Credit signature

1. Find $\int 6x^3 + x^{\frac{1}{2}} + \frac{x^2}{2} + 7\,dx$

2. Find $\lim_{x\to\infty} \frac{7x - 100 - 5x^3}{25x^3 + x^2 + 7}$

3. Implicitly find $\frac{dy}{dx}$ if $x^3y^2 + e^{2x}\ln y = 17$

4. Find y' by logarithmic differentiation $y = \sqrt[5]{\frac{t^3+100}{t^2+t+1}}$

5. Find $\int e^{\ln(x+2)}\,dx$

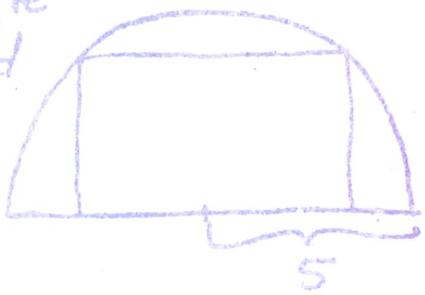
6. For an annuity of $200 at the end of every 6 months for $6\frac{1}{2}$ years, find A, the present value and B the future value at an interest rate of 8% compounded semi-annually.

7. Use the tangent line (or differential) to approximate $\frac{1}{2.09}$

8. Find the area of the region bounded by the curves $y = x+3$ and $y = x^2 - 4x + 3$

9. Jane borrows $1000 and agrees to make $100 a-month-payments. Money is worth 6% compounded monthly. How many monthly payments will Jane make?

10. Find the dimensions of the rectangle of maximal area which can be inscribed in a semi-circle of radius 5



M403K FINAL PT2 15DEC87 name

Each Problem Worth 10 points ssno

Show ALL Work for Credit signature

1. Find $\lim_{x \to 3^-} \dfrac{x^2-9}{x^3-4x^2+3x}$

2. $\int t e^{3t^2+7}\, dt$

3. Find all x so that $\log_x (6-x) = 2$

4. Find the equation of the tangent line to $y = (x^2-3)^{100}(5x+6)^{1/2}$ at $x=2$

5. Find y given $y'' = 2 - \frac{1}{x^2}$ $y'(1) = 3$ $y(1) = 2$

6 A person borrows $2000 and agrees to pay it off by equal payments at the end of each month for 3 years. If interest is at 15% compounded monthly, how much is each payment?

7 Find $\int_1^4 \frac{(9\sqrt{z}+7)^{1/2}}{\sqrt{z}}\,dz$

8 Find all relative mins and maxs and all points of inflection of $f(x) = 2x^3 - 15x^2 + 36x$ (graphing NOT required)

9 Find $\lim_{h \to 0} \dfrac{\sqrt{x+h} - \sqrt{x}}{h}$

10 Carefully graph $y = \dfrac{x}{x-1}$